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6 Set-up Parameters and Rules

The EPA Base Case 2000 includes a number of assumptions that affect the way IPM treats the analysis horizon, retrofit assignments, and environmental specifications for trading and banking. This section provides an overview of those assumptions.

6.1 Run Year Mapping

Although IPM is capable of representing every individual year in an analysis horizon, individual years are typically grouped into model run years to increase the speed of modeling. While the model makes decisions only for run years, information on non-run years can be captured by mapping run years to the individual years they represent.

The analysis horizon for EPA Base Case 2000 extends from 2005 through 2022 with four model run years in five year increments from 2005 to 2020. To avoid boundary distortions, the model looks 8 years beyond the end of the analysis horizon and minimizes net present value over the 26-year period from 2005 to 2030. The run year mapping used in EPA Base Case 2000 is shown in Table 6.1.

Table 6.1. Run Years and Analysis Year Mapping Used in the EPA Base Case 2000

Run Year	Years Represented
2005	2005 - 2007
2010	2008 - 2012
2015	2013 - 2017
2020	2018 - 2022

6.2 Retrofit Assignments

In IPM, model plants have the option of maintaining their current system configuration, retrofitting with pollution controls, repowering, or retiring early. The decision to retrofit, repower, or retire is endogenous to IPM and based on the least cost approach to meeting the system and other operating constraints included in the EPA Base Case 2000. IPM is capable of modeling retrofits and early retirements in two stages, in which model plants can install two different retrofits incrementally at different points in time. Projections of pollution control equipment capacity and early retirements in the EPA Base Case 2000 are entirely contingent on the retrofit and retirement options that are provided in setting up the modeled scenario.

Table 6.2 below summarizes the first stage pollution control and retirement options provided under EPA Base Case 2000. Table 6.3 below shows the second stage options. The costs of multiple retrofits on the same model plant, whether installed in one or two stages, are assumed to be additive.

Table 6.2. First Stage Retrofit Assignment Scheme in EPA Base Case 2000

Plant Type	Retrofit Option 1 st Stage	Criteria
Combined Cycle	Early Retirement	All combined cycle units
Combustion Turbine	Early Retirement	All combustion turbine units
O/G Steam	Early Retirement	All O/G steam units
	Combined Cycle Repowering	All O/G steam units
	SCR	All O/G steam units that do not possess an existing post combustion NO _x control option
	SNCR	All O/G steam units that do not possess an existing post combustion NO _x control option
Coal Steam Plant	Early Retirement	All coal units
	Combined Cycle Repowering	All coal units smaller than 500 MW
	IGCC Repowering	All coal units smaller than 500 MW
	SCR	All coal steam units that are 100 MW or larger and do not possess an existing post combustion NO _x control option
	Low NO _x SNCR	All coal steam units that have a NO _x rate lower than 0.5 lbs/MMBtu and do not possess an existing post combustion NO _x control option
	High NO _x SNCR – Cyclone	All cyclone coal steam units that have a NO _x rate of 0.5 lbs/MMBtu or higher and do not possess an existing post combustion NO _x control option
	High NO _x SNCR – Non Cyclone	All non cyclone coal steam units that have a NO _x rate of 0.5 lbs/MMBtu or higher and do not possess an existing post combustion NO _x control option
	Gas Reburn	All coal steam units that have a NO _x rate higher than 0.5 lbs/MMBtu and do not possess an existing post combustion NO _x control option
	LSFO Scrubber	All unscrubbed coal steam units 100 MW or larger and burning BF or BG coal
	LSD Scrubber	All unscrubbed coal steam units 550 MW or larger and burning non BG coal
	MEL Scrubber	All unscrubbed coal steam units 100 MW or larger and smaller than 550 MW and burning non BG coal
	Low Sulfur Bituminous Hg Control Option*	All coal plants larger than 25 MW and burning non BF & BG bituminous coal
	High Sulfur Bituminous Hg Control Option*	All coal plants larger than 25 MW and burning BF & BG coal
	Sub-Bituminous Hg Control Option*	All coal plants larger than 25 MW and burning Sub Bituminous coal
	Lignite Hg Control Option*	All coal plants larger than 25 MW and burning Lignite coal
	LSD Scrubber + SCR	All unscrubbed coal steam units 550 MW or larger and burning non BG coal
	LSD Scrubber + SNCR	All unscrubbed coal steam units 550 MW or larger and burning non BG coal
Nuclear	Early Retirement	All nuclear units
	10-year life extension at Age 30	All nuclear units that have yet to replace their steam turbines
	20-year life extension at Age 40	All nuclear units

Note

*The listed Hg control options are provided, but not exercised, in EPA Base Case 2000. They are available if needed for policy runs that involve mercury reductions.

Table 6.3. Second Stage Retrofit Assignment Scheme in EPA Base Case 2000

Plant Type	Retrofit Option 1 st Stage	Retrofit Option 2 nd Stage
Coal Steam	NO _x Control†	SO ₂ Control Option†† or Hg Control Option*
	SO ₂ Control Option	NO _x Control Option or Hg Control Option
	LSD Scrubber + SCR	Hg Control Option
	LSD Scrubber + SNCR	Hg Control Option
	Hg Control Option	None**
	Gas Reburn	SO ₂ Control Option
Nuclear Plant	10-year life extension at Age 30	20-year re-licensing at Age 40

Notes

†"NO_x Control Option" implies that a model plant may be retrofitted with one of the following NO_x control technologies: gas reburn, SCR, low NO_x SNCR, high NO_x SNCR - cyclone, or high NO_x SNCR - non cyclone

††"SO₂ Control Option" implies that a model plant may be retrofitted with one of the following SO₂ control technologies: LSFO scrubber, LSD scrubber, or MEL scrubber

*"Hg Control Option" implies that a model plant may be retrofitted with one of the following activated carbon injection technology options for reduction of mercury emissions: low sulfur bituminous Hg control, high sulfur bituminous Hg control, sub-bituminous Hg control, or lignite Hg control. The listed Hg control options are provided, but not exercised, in EPA Base Case 2000. They are available if needed for policy runs that involve mercury reductions.

**When modeling certain environmental regulatory specification in future policy runs, 2nd stage retrofit options, such as SO₂ and NO_x controls, may be offered following a first-stage mercury control.

6.3 Trading and Banking

Two environmental air regulations included in EPA Base Case 2000, involve trading and banking of emission allowances¹: the Title IV SO₂ program and NO_x SIP Call program. Table 6.4 below summarizes the key parameters of these two trading and banking programs as incorporated in EPA Base Case 2000. Trading and banking are modeled on a system-wide basis. EPA Base Case 2000 does not include any explicit assumptions on the allocation of emission allowances among model plants.

Table 6.4. Summary of Assumptions on Trading and Banking Rules in EPA Base Case 2000

	SO ₂	NO _x
Coverage	All SO ₂ - emitting sources > 25 MW in the U.S.	Fossil units in the SIP Call states*
Timing	Annual	Summer (May - September)
Size of initial bank	3.69 million tons in 2005	The bank starting in 2005 is assumed to be zero.
Rules		
Total Allowances	2005 - 2009: 9.47 million tons	472.96 thousand tons
	2010 - 2030: 8.95 million tons	472.96 thousand tons

*Alabama, Connecticut, District of Columbia, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, and West Virginia

¹For a detailed discussion of the assumptions of all the environmental air regulations included in the EPA Base Case 2000, see section 3.9. For the characteristics of state-specific trading programs in Texas, Connecticut and Missouri, see section 3.9.4. None of these state-specific programs involve banking.